



The **universal** nature of **Mathematics**



Provocation

Why is Mathematics a universal language and where can it be found?

We began unpacking our central idea "*Mathematics is a universal language that is organised using symbols and operations*" by locating and investigating patterns we found in the natural environment. We started considering the way in which these patterns could be represented through other mediums. The work of Andy Goldsworthy captured our imagination

Natural sculptures by **Andy Goldsworthy**.

"Andy Goldsworthy is an extraordinary, innovative British artist whose collaborations with nature produce uniquely personal and intense artworks. Using a seemingly endless range of natural materials—snow, ice, leaves, bark, rock, clay, stones, feathers petals, twigs—he creates outdoor sculpture that manifests, however fleeting, a sympathetic contact with the natural world. Before they disappear, or as they disappear, Goldsworthy, records his work in superb colour photographs."

<http://visualmelt.com/Andy-Goldsworthy>

This led the girls to collect and create their own patterns as investigated the influences of symmetry, growth patterns and the Fibonacci sequence. Recording their artworks was an integral aspect of this exploration and they conducted interviews, time-lapses, movies and photographs of the work in progress and final creations. These have been recorded in individual journals.



Mathematics as a fundamental form of beauty in The Arts

What have you been exploring in Music lessons?

There was 12 tones *Emily*

It's 12 tone music *Serae*

It means there are 12 notes in a piece of music *Sophie*

12 types of sounds and you can play them more than once *Sydney*

Can you use each sound (tone) more than once? *Sophie*

It's quite exciting *Sydney*

It is nice to listen too *Lily*

Sometimes it's quiet but sometimes its noisy *Annie*

It can go quiet, quiet, noisy, noisy *Sydney*

We have seen some movies of people playing 12 Tone music. We will be using the iPad app 'Mad Pad' to create our own 12 Tone pleasant music.

What have you been creating in Visual Art?

We have listened to some songs and we have painted and drew what we feel. We have thought about the way the music makes us feel: happy, sad, excited, surprised, angry, frustrated, nervous, crazy, sleepy.

How did you translate the feeling the music evoked onto the paper?

We had a paintbrush and whatever the thing told us to do our brains just told our fingers. You might have done lots of dots and a swirl and lots of dots and a swirl. *Eve*

Maybe just a line in squiggles and then you could use your fingers too. It got higher then lower then higher in the music and then we drew that on the page *Emily*

For the crazy frog you could use your fingers and go up and make swirls *Sophie*

If you are listening to some music and you wanted to paint about it you could draw line then a dot dot and it means it is loud and too noisy. This is what I thought. *Bettina*

Bettina, you chose a symbol to represent a certain meaning and that is what mathematicians do! So where is the maths? *Mrs Clark*

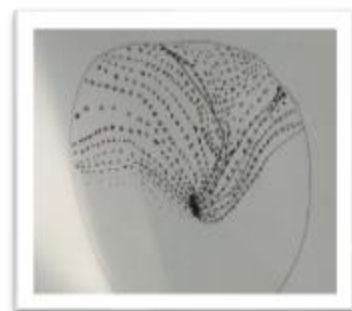
When it got loud I drew something big, big lines, but when it got quiet I drew something small and some dots and when it got crazy I did lot of squiggles. Some songs went in a pattern and it had then same thing (sound) and then it had a different sound then (went back to) the same sound so on my paper it looked like a pattern. *Evelyn*

So Evelyn, you listened to the music, drew symbols to show how you felt and saw and heard a pattern. Quite a few of you have seen and heard a pattern! *Mrs Clark*

Investigating symbols

Where else can mathematical symbols be found?

- In nature?
- In the museum in Aboriginal paintings – that reminds the girls of their inquiry into symbols last year and we can draw on that experience and knowledge
- Money – s with a line through it \$ means a dollar sign and a little c on the end for cents!
- Numbers are symbols. Not every country in the world uses the same symbol
- In our maths books – equal signs, plus signs – they could be symbols
- Signs like speed limits, directions, stop. Maybe there are maths symbols in mapping and direction



We investigated the Fibonacci spiral within sunflowers. The girls investigated the inside of the spiral and how it is based upon the Fibonacci spiral sequence of numbers. The girls used magnifying glasses and studied the form of the flower. They then sketched and painted their flowers throughout art.

What is our next step?

- bring in money from around the world and investigate the symbols we can find
 - Aboriginal paintings to find out about the symbols they use.
 - find out if other cultures use symbols in their traditional paintings too?
 - look at numbers, numerals and counting systems around the world to find the symbols
 - investigate mapping and directions (road symbols)
 - exploring 12 tone music and graphic notation in our specialist lessons



Money from 2SB

We have had girls bringing in money from different countries and making the link between our Australian dollars and different values and symbols.

Stella – 1000 Balinese Baht isn't \$1000 Australian dollars, but I thought it was a lot more.

Eva – Greek, Drakmar – old Greek money – now European countries have Euros

Savannah - Dubai – Dirhams

Savannah - Germany – Euros

Savannah - Fiji – Fiji Dollars

Eva – Singapore – dollar

Eva – Bangkok –

Grace - \$2 paper note – now we have coins – “ooh different” class were amazed no longer have coins

Grace - \$100 American=\$130 Australian dollars

Alyssa – 100 Escudos – “is it 100 dollars?”

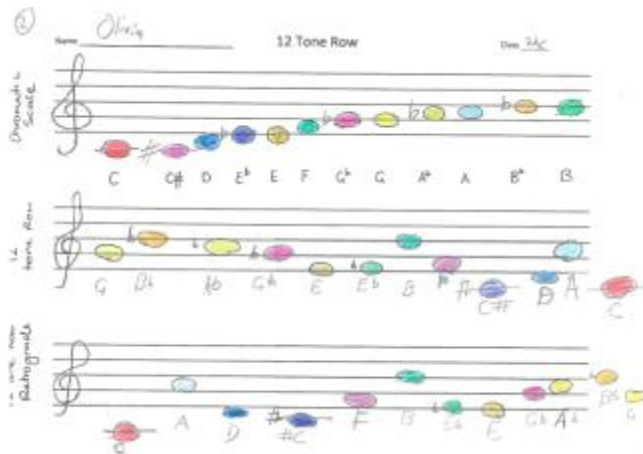
Eva – “hole in money?”

Angelina – “Why is money so dirty?”

Niamh – money has ‘symbols’ different animals on them PNG and coin with hole in it – Kina

Investigated \$ for dollar and c for cent – not a ‘s’ for cent but a ‘c’. Girls a little puzzled as it sounds the same.

Musical Steps...



We used three rows to record our music. On the first row we colour coded the 12 notes. On the second row we mixed up the notes and in the third row we recorded that pattern backwards. It was very tricky and took a while! Next week we will use Mad Pad on the iPads to record the 12 notes and play our music!

Individual Inquiries...

Today the girls started investigating their own lines of inquiry from the brainstorming that we shared in our last session.

Symbols on coins...

Different countries use different symbols and have different coloured coins. *Sydney*

Money all over the world doesn't cost the same as here (exchange rates) *Olivia*

People have different prices for their money. If something is \$1 here it might be \$2 there (even if they use the same symbol on the coin) *Sophie*

I am wondering why American money is different and uses different symbols *Annie*



Symbols and signs...

When I go to school I see a sign with a person and a police facing it (green and white) but I don't know what it means *Serae*

Why do stop signs have to be red and the writing white? *Sienna*

Some signs have 3 arrows *Emily*

Patterns in nature...



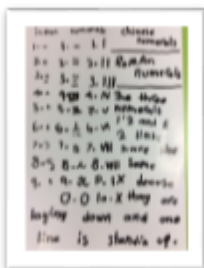
I noticed that inside the flower in the middle it was really small but also in the middle it had different amount of petals and outside it had another amount. But sometimes it was the same amount. *Lily*

Reflections...

After sharing our individual observations and findings we have some more questions:

- Do mathematical symbols always mean the same thing all over the world?
- What makes something a mathematical symbol?

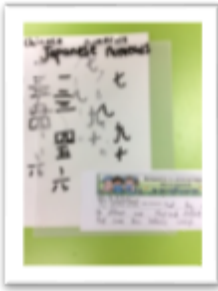
Numerals around the world



Last session we posed some questions about mathematical symbols from around the

We were investigating the line of inquiry: patterns, symbols and operations, and we wanted to find out about the symbols people around the world use when recording their numbers. As a group we chose to google Chinese numerals, because we have some girls who speak and learn Chinese in our class. We discovered that although the Chinese numerals looked like Japanese numerals, they don't sound the same.

Reflections...



In groups or by ourselves we investigated other numerals from around the world. Some of the symbols are the same or very similar; like English, American, French, Italian, or Chinese and Japanese. But some of them are quite different, like Arabian, Roman or Arabic.

Where to next?

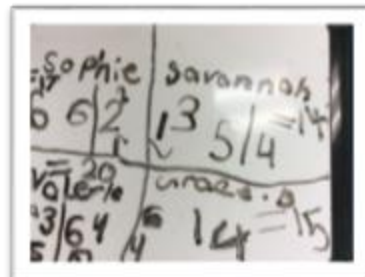
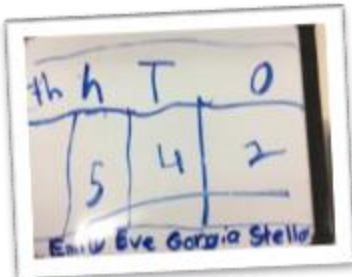
This led to some questions...

- If it is the same maths that people use all over the world why aren't the symbols they use the same?
- That made us wonder; is it the same maths, or is it different. And if the maths is different, how is it different?



The Building Game

We introduced 'The Building Game' to explore the base-ten number system. The girls worked in eight small groups and developed a community name. They used a six sided die to roll and collect paddle-pop sticks. Ten paddle-pop sticks can be exchanged for a tens-stick and ten tens-sticks can be exchanged for a hundreds flat. The groups needed to keep a running total of the value of their building. All the groups recorded in a different way...



They have all used symbols!
Sydney



Individual Inquiry...

We spent some time continuing our individual investigations. A group of girls became fascinated with the patterns and shapes found within a bee hive during guided reading today. They used google images and watched a youtube video <https://www.youtube.com/watch?v=821uVRAcZ1I&noredirect> to watch the formation, then found the hexagonal shapes in our maths equipment to design their own beehives.

Other girls continued their investigations into the symbols on different notes and coins.

Some girls looked at different road signs around the world and compared the similarities and differences. Emily looked at traffic lights and Rose looked at stop signs. The shape and colour were the same but other features on these symbols were different.

Now we are wondering...

Are beehives a mathematical structure? Are there other mathematical structures in nature; like spider webs?

First we need to work out (define) what we think a mathematical symbol is...



Artistic Links in Music and Art

In Music we finished writing our 12 tone music and then we had to write it backwards. We used 'mad Pad' a recorded our own sounds on the iPad.

In Art we put ink on the paper and we recorded with the iPad while our partner was making patterns with the ink. We made a movie with the time lapse video and pictures. We found music to match.

Maths Links:

- Patterns that we can see and hear
- The sharp symbol and the flat symbol in music
- The numbers in the 12 tone piece of music

Reflections...

Mathematical symbols can be found in lots of different places like in the museum and schools. We use symbols to write numbers and show the collections we have made (the blocks in the Building Game). There are symbols on money that we use at the tuckshop.

A mathematical symbols has a meaning *Sienna*
It tells us something like a code *Kiera*

Symbols can look different like the stop signs from around the world but we know they mean 'stop' because they are all red and have white writing, the writing is different but the symbols are similar.



Mathematics in Movement and Dance

Maths is important in life every day and can include dance. In music and dance to keep in time we need to count, 4, 8, 12 and 16 which are used a lot. You may need to count how many steps to travel across the floor and this helps to keep the beat to the music.



KABOOM Percussion

Our show is not something to just sit and range of traditional and found percussion instruments, with a focus on creating incredible music with simple and common instruments and objects, and demonstrates how easily students can make music with things in their own environment. KABOOM Percussion

After the performance the Year 2 Girls interviewed the performers to find out if they use mathematics in their music. The answer was YES!

Cat and Josh said that they do lots of counting to get the right beats in a bar. They make patterns, called rhythms, in music:

Pattern of 2 or Patterns of 3

Bars are divided in to 4 beats so across 2 bars there are 8 beats to play with.

Finding the connection between Mathematics and Music

Was there any maths in the performance?

Yes, in the beats we were repeating rhythms *Soraya*

In the beats. We counted the beats so we knew how many times to play them *Sydney*

They had to count how many times they had to repeat it *Nieve*

In each bar there is the same amount of beats. Titi- fast Ta-slow *Lucy T*

They were going up to 4 beats *Emily*

We have 12 (in the 12 Tone music system) and they have 4 beats to the bar *Eva*

Percussion Patterns

We took this idea to start exploring standard music, as opposed to the 12 tone music system being investigated in Music. During the next inquiry session the girls located 'found' percussion instruments and experimented with the sounds. They used 2 bars to compose their own percussion piece. The girls recorded their own symbols to represent the beats per bar. They discovered there is a difference between a free-form 12 tone system to a standard structured 4 beat per bar system!



Mathematics in Music



We invited the String Quartet to play for us on Chiverton lawns. We wanted to experience listening to music as we gathered, planned and created patterns. The music was calm and relaxing. We could hear big sounds and little sounds. Big leaves, rocks and pinecones were popular objects to represent the big sounds and smaller objects like grass, stones and twigs showed the slower sounds.

Keeping beat to the music *Serae*

When the music went slow it felt like a spiral *Hayley*

The rocks are like the short notes. The leaves are like the long notes and the stick with the spikes are like short and long notes *Olivia*



String Quartet and Mathematics



Year 2 Assembly Slideshow